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Introductory Remarks: I want to thank Congressman Jeff Fortenberry and his staff for the opportunity to address this subcommittee on Africa, Global Human Right and International Operation and to share several thoughts. Let me introduce myself. I am Bing Chen from the University of Nebraska's College of Engineering. I am professor and chairperson of the Department of Computer and Electronics Engineering (CEEN) located on the Omaha campus. CEEN is part of the Peter Kiewit Institute of Information Science, Technology and Engineering (PKI) and is a collaboration between two NU universities and industry. Adjacent to PKI is the Scott Technology Center research park and our local leaders have invested \$200M in the STC/PKI complex over the last decade. We have worked with military, public and private entities such as STRATCOM, Henry Doorly Zoo, Ameritrade, SCOLA (Satellite Communications for Learning), L3 Communications, Level 3 Communications, Union Pacific railroad, Kuka Robotics and the University of Nebraska Medical Center. Our research work with the aforementioned entities could have healthcare and medical applications in underdeveloped regions of the world.

Problems being studied in Nebraska by CEEN are focused on studying real world problems which have are responsive to Nebraska economic development interests and exploring projects with societal impacts. These projects involve CEEN students and faculty. Student participate from all levels: ranging from freshman feasibility studies such as the portable classroom (spring 2006), senior thesis projects (wireless biometric sensing and RFID tracking of patients) and graduate research (wireless video monitoring with pattern recognition at the Henry Doorly Zoo's Lied Jungle) have applications which may translate to the Foreign Aid interests which the House may wish to consider and pursue. We also work with the University of Nebraska Medical Center to identify applications of new technologies such as RFID and Wireless Sensor Networks in the Omaha metro area hospitals, clinics, and other medical facilities. Applications such as patient and medical assets tracking and monitoring in the health care facilities.

Examples of projects being performed by CEEN which may have applicability to the House Subcommittee's interests:

1. Duchesne Academy of the Omaha Archdiocese wishes to extend its "Computers for Africa" program which focuses on schools in Uganda to providing live education in subjects such as physics and mathematics. Ameritrade chairman Joe Ricketts had us explore the feasibility of delivering education to Africa via satellite. PKI has links to European Command and the potential use of underused satellite time. CEEN is exploring

the use of satellite connections from Omaha to Ugandan schools. Then we are exploring the possibility of distributing this downloaded satellite data to neighboring schools within a 20-30 mile range via new wireless technologies such as the IEEE standard 802.16 to receive lessons from stateside. We intend to employ photovoltaic (PV) and/or wind systems with full signal conditioning to provide back up AC power whenever and wherever called for. We have made visits to NSF to discuss and determine what is currently available in Africa. PKI has a state-of-the-art "near presence classroom" which employs Access Grid technology permitting multiple formats to be transmitted live for Big 12 ECE schools to share curriculum that engages students from different campuses to participate actively. This technology could be used for real time meetings between continents if bandwidth, power and communications requirements can be adequately addressed. This infrastructure could easily be adapted to provide medical and health care training and education for different areas in Africa. Medical advice and alerts could be directly delivered to people in Africa as a part of these educational activities.

2. Wireless biometric monitoring systems worn by patients in rural areas who need not be in hospitals but which can alert medical parties and medical data that can be accessed by physicians. Beginning in 2000 a sequence of senior thesis projects collected biometric data which includes pulse rate, oxygen, blood pressure and ECG. We have added GPS data to track the patient should they need to be found. Prototype designs have successfully demonstrated technical feasibility with existing wireless technologies such as Bluetooth and cellular phones. Developing a biosensor that could detect diseases that are endemic to a region could alleviate the lack of health care professionals by having some combination of AI and on board digital processing available for diagnosis in the field. With wireless biometric monitoring devices such as those we have experimented with could enable medical teams and personnel to monitor health issues remotely through wireless links.

3. Portable classroom project to perform a feasibility study by freshman CEEN students for a portable classroom for up to 50 students that could be shipped via C-130 cargo plane. Characteristics: portable structures would be lightweight, quickly erecting and depending on need (desert, jungle, mountain region, utilizing satellite downlink to plasma screens for full duplex (both way) communications with Access Grid capability (multiple formats being received simultaneously (video, audio, Power Point and overheads) and laptops driven by software appropriate to the regions and specific subjects (medical, K-12 education being supported, other subjects). Learning can be with direct link to educators/consultant or individually by self learning depending on the availability of local human resources. Power can be generated from various possible sources: PV (flexible wrap around arrays), smaller wind generators of under 10 KW, wood burning electric generators (when wood/cellulose is available), ocean wave power (for coastal/island applications). Direct communications back to US via satellite or to host country ministries could be established from the portable classrooms. Application of remote video transmissions in real-time will enable medical groups to remotely diagnose and provide advice for patients.

4. CEEN is working with the Henry Doorly Zoo (Omaha, Nebraska) to develop wireless video links with the goal of monitoring wildlife in general and specifically pandas in Foping Nature Reserve using the new IEEE wireless standard 802.16 with a telecom network that transmits data from node to node in a daisy chain fashion. Live data will be transmitted via satellite and/or internet link back to Omaha. The wireless video links can include biometric data such as infrared (IR) sensors as well. These units can provide passive and active monitoring to other locales with different applications such as intrusion detection across borders or throughout a region. Similarly, this approach could be utilized to monitor environmental changes which may have medical impacts when certain vectors which contribute to endemic diseases are detected early enough for timely action to be brought to bear.

Observations:

From CEEN's initial observations from our studies: Africa's internet resources are spotty at best, power is either unavailable and/or unreliable and ground communication infrastructure to remote areas is as yet underdeveloped.

Recommendations that the House Subcommittee on Africa, Global Human Rights and International Operations may wish to consider:

1. We would propose that economic feasibility studies be performed to assess the need for an Africa specific satellite with direct links back to United States. Estimate the rate at which internet technologies are and will be distributed throughout Africa and extrapolate the need for a satellite dedicated to Africa. The main focus will be the medical applications and how the technology can facilitate this goal.
2. We propose that potential uses of such a satellite platform to provide education (from a temporary basis such as in Dhafur to something more permanent such as a church school in Uganda) especially for medical applications. Assess the reliability of power in each of these instances and internet availability and reliability. In each case determine what power resources are available and tailor a solution which could employ wind, PV, bio-fuels and tidal power.
3. We propose that when it is determined that economic resources should be made available to regions which are under stress from food and water shortages, political, tribal and religious unrest, environmental and climate duress, or endemic disease crisis that technological solutions which are reliable and self sufficient can be employed to impact the health care and education in the area.

I would like to conclude my remarks with a quote from Albert Schweitzer,

“Only by means of reverence for life can we establish a spiritual and humane relationship with both people and all living creatures within our reach. Only in this fashion can we avoid harming others, and, within the limits of our capacity, go to their aid whenever they need us.”